

REMEDIAL ACTION GROUND-WATER MONITORING PLAN

ORMET PRIMARY ALUMINUM CORPORATION

SUPERFUND SITE

HANNIBAL, OHIO

REVISION 1

APRIL 28, 1997

Prepared for:

**Ormet Corporation
Hannibal, Ohio**

Prepared by:

US EPA RECORDS CENTER REGION 5



473436



HMI

Environmental Consulting Services

HYDROSYSTEMS MANAGEMENT, INC.

Glass Works Center - Suite 109

331 S. Main Street

Washington, PA 15301

TABLE OF CONTENTS

	<u>PAGE</u>
1.0 BACKGROUND	1
2.0 OBJECTIVES	2
3.0 GROUND-WATER MONITORING PROGRAM DESCRIPTION	3
3.1 GROUND-WATER FLOW MONITORING	4
3.2 GROUND-WATER QUALITY MONITORING	5
4.0 SAMPLE COLLECTION PROCEDURES	7
4.1 WATER-LEVEL MEASUREMENTS	7
4.2 SET-UP FOR SAMPLE COLLECTION	9
4.3 PURGING THE WELL	9
4.4 SAMPLE COLLECTION PROCEDURES	10
4.5 FIELD ANALYSES OF GROUND-WATER SAMPLES	11
4.6 SAMPLE PREPARATION & PACKAGING	12
4.7 FIELD QA/QC SAMPLES	12
4.7.1 Equipment/Rinsate Blanks	13
4.7.2 Trip Blanks	13
4.7.3 Duplicate Samples	13
4.8 RECORDING OF FIELD DATA AND LABELING OF SAMPLES	14
4.8.1 Recording Field Data	14
4.8.2 Sample Labels	15
4.9 FIELD CHAIN-OF-CUSTODY PROCEDURES	16
5.0 DATA REDUCTION, EVALUATION AND REPORTING	17

LIST OF TABLES

Table 1	Parameters to Be Analyzed and Laboratory Methods to Be Used in Ground-Water Analyses
---------	--

LIST OF FIGURES

- Figure 1** **Water-Table Contour Map Based on Water-Level Data Collected 6-20-88**
- Figure 2** **Water-Table Contour Map Based on Water-Level Data Collected 2-20-90**
- Figure 3** **Sampling of Monitoring Wells Daily Checklist**
- Figure 4** **Water Sampling Log**
- Figure 5** **Sample Label**
- Figure 6** **Chain-of-Custody Seal**
- Figure 7** **Chain-of-Custody Record**

**REMEDIAL ACTION GROUND-WATER MONITORING PLAN
ORMET PRIMARY ALUMINUM CORPORATION
SUPERFUND SITE
HANNIBAL, OHIO**

1.0 BACKGROUND

This document describes the Remedial Action Ground-Water Monitoring Plan for the Ormet Primary Aluminum Corporation (Ormet) Superfund site at Hannibal, Ohio.

The Remedial Investigation (RI) for the site concluded that the predominant source of ground-water alterations in the alluvial aquifer beneath the site is the former spent potliner storage area (FSPSA). Under current pumping conditions (i.e., continued operation of the Ormet Ranney well and interceptor wells), ground-water flow in the alluvial aquifer is generally from northeast to southwest, toward the Ormet Ranney well and interceptor wells. Water-level elevation contour maps presented in the RI Report are provided as Figures 1 and 2. Pumping of the Ranney well also maintains the water table at an elevation below the pool level of the Ohio River. As a result, the plume is contained in the alluvial aquifer (i.e., a hydraulic potential does not currently exist for the natural discharge of ground water from the alluvial aquifer to the Ohio River along the Ormet river/plant boundary).

The remedy selected in the U.S. Environmental Protection Agency (USEPA) Record of Decision (ROD) for the site includes, among other measures, the application of water (soil flushing) in the FSPSA to accelerate the leaching of soluble constituents from soils in that area, and continued pumping of the Ormet Ranney well and the interceptor well system to contain the plume in the alluvial aquifer and to extract ground water for treatment. The ROD also set forth cleanup goals for constituents in ground water, as follows:

<u>Ground-Water Constituent</u>	<u>Cleanup Goal ($\mu\text{g/L}$) Set Forth in ROD</u>
Arsenic	10*
Beryllium	4
Manganese	230*
Vanadium	260
Cyanide	200
Fluoride	4000
Tetrachloroethene	5

- * - The USEPA and Ormet negotiated a Consent Agreement and associated Statement of Work (SOW) for implementation of the ROD. Because arsenic and manganese are common ground-water constituents in the Ohio River Valley and can occur naturally at concentrations above the cleanup goals presented in the ROD, the SOW specified that as part of the Remedial Design (RD) process, Ormet would conduct a statistical evaluation to determine background levels of arsenic and manganese in the alluvial aquifer. The resulting background levels would then be considered for use as cleanup goals in place of the levels presented in the ROD. The results of the statistical analyses, which are presented in the August 28, 1996 HydroSystems Management, Inc. report titled, "Statistical Analyses of Background Levels for Manganese and Arsenic in Ground Water", indicated background levels of 40 $\mu\text{g/L}$ for arsenic and 9,780 $\mu\text{g/L}$ for manganese.

2.0 OBJECTIVES

The general objectives of the ground-water monitoring program for the Ormet site are to monitor changes in the concentrations and mass of contaminants in the alluvial aquifer as a result of remedial actions at the site (e.g., soil flushing), and to ensure that recharge resulting from the

FSPSA soil flushing system does not create hydraulic gradients that would cause altered ground water to discharge from the alluvial aquifer to the Ohio River.

Specific objectives of the monitoring program include the following:

- Provide water-level elevation data that will enable evaluation of ground-water flow and the hydraulic relationship between ground-water in the alluvial aquifer and the Ohio River;
- Provide ground-water quality data to evaluate/identify contaminant concentrations versus time as the remedial program (i.e., soil flushing) proceeds; and,
- Provide ground-water quality data to prepare periodic estimates of the mass of contaminants dissolved in the alluvial aquifer and the total area of aquifer containing cyanide and fluoride levels above the cleanup goals set forth in the ROD.
- Collect additional data regarding background concentrations of arsenic and manganese in ground water in the alluvial aquifer to be used in confirming appropriate cleanup goals for these parameters.

3.0 GROUND-WATER MONITORING PROGRAM DESCRIPTION

The Remedial Action ground-water monitoring program for the Ormet site has two main components, hydraulic gradient, or ground-water flow monitoring and ground-water quality monitoring. Each component of the monitoring program is described in the following sections.

3.1 GROUND-WATER FLOW MONITORING

Following start-up of the FSPSA soil flushing system, the hydraulic containment provided by the existing Ranney and interceptor wells will be monitored as specified in Section II.6. of the SOW. During the first two months of the soil flushing operation, hydraulic containment will be monitored at one-week intervals. Each weekly monitoring event will include collection of water-level measurements from a group of monitoring wells and piezometers forming a line roughly perpendicular to the Ohio River and the direction of ground-water flow in the alluvial aquifer beneath the area of interest. These wells are shown on Figures 1 and 2 (prepared using data obtained during active pumping of the Ormet Ranney well and interceptor well) and include the following:

MW-14	MW-38
MW-32	MW-39 S&D
MW-35	PPB-06

The Ohio River pool elevation will also be recorded during each monitoring event. Water-level elevation data from the selected wells/piezometers and the river will be compared to assess the hydraulic relationship between the river and the aquifer beneath the area subject to soil flushing. Ground-water elevations in the aquifer that are lower than the river pool elevation indicate that containment of the plume is being maintained. If water-level elevation data indicate that the operation of the soil flushing system has created a hydraulic potential for the movement of ground water from beneath the FSPSA toward the Ohio River, the average flushing rate will be reduced (by altering spray duration or frequency) to restore containment of the plume.

Following the initial two-month monitoring period, water-level elevations will be recorded for all monitoring wells and piezometers at the site once every four months, in conjunction with routine ground-water monitoring. These data will be used to construct a site-wide ground-water elevation contour map and will provide further monitoring of hydraulic containment of the plume in the alluvial aquifer.

3.2 GROUND-WATER QUALITY MONITORING

As specified in Section II.6. of the SOW, ground-water quality monitoring will be conducted three times per year (approximately every four months), beginning within four months following completion of remedial construction. In accordance with correspondence from USEPA dated March 13, 1997, a ground-water monitoring event will also be conducted prior to remedial construction. As part of each monitoring event, depth-to-water measurements will be collected from all MW- and TH-series monitoring wells, PPB-series piezometers, and the established Ohio River pool measuring point. These data will be used to construct a ground-water contour/flow map for the alluvial aquifer.

Each monitoring event will include collection of ground-water samples from the following wells located within and downgradient from the FSPSA (see Figures 1 and 2):

MW-2	MW-31
MW-5	MW-32
MW-16	MW-35
MW-18	MW-36
MW-28	MW-37

Each monitoring event will also include sampling of MW-12, located immediately downgradient of the CMSD. Monitoring well MW-12, along with the wells listed above for the FSPSA, will be regarded as the Points of Compliance, as required under Section II.6. of the Statement of Work.

One monitoring event each year and also the pre-remedial construction monitoring event will include collection of ground-water samples from the wells listed above and also from additional selected wells that are not hydraulically downgradient from any of the potential source areas at the site (i.e., background wells) and from wells located within the main plume body outside of the FSPSA. These wells include the following:

MW-1	MW-29S&D
MW-7 (background)	MW-30
MW-8	MW-34 S&D
MW-10	MW-39 S&D
MW-11	MW-40 S&D
MW-15	MW-41 (background)
MW-17	MW-42 S&D
MW-19 (background)	

Ground-water samples from all monitoring wells will be analyzed for the following constituents for which clean-up goals were set forth in the ROD: arsenic, beryllium, cyanide, manganese, vanadium, and fluoride. In addition, all samples will be analyzed for pH, specific conductance, and sodium, which are important indicators of the plume in the alluvial aquifer and are less prone to analytical variability than cyanide. Samples from monitoring wells MW-2, MW-5, MW-18, MW-30, and MW-31 will also be analyzed for tetrachloroethene (PCE). Wells being analyzed for PCE are those wells where PCE was detected during the RI. During each monitoring event, all samples will also be analyzed in the field for pH and specific conductance. Analytical methods to be used in analyzing ground-water samples from routine monitoring events will be as follows:

<u>Analytical Parameter</u>	<u>Analytical Method</u>	<u>Ground-Water Clean-up Goal ($\mu\text{g/L}$)</u>	<u>Reporting Limit ($\mu\text{g/L}$)</u>
Arsenic	SW846/6010A-trace ICP	*	4
Beryllium	SW846/6010A-trace ICP	4	0.5
Manganese	SW846/6010A	*	10
Vanadium	SW846/6010A	260	10
Cyanide (total)	SW846/9010A	N/A	10
Cyanide (amenable)	SW846/9010A	200	10
Fluoride	EPA 340.2	4000	100
Tetrachloroethene	SW846/8260A	5	5
pH	EPA 150.1	N/A	N/A
Specific Conductance	EPA 120.1	N/A	N/A
Sodium	SW846/6010A	N/A	500

N/A - Not Applicable

* - Final determination of clean-up goals for arsenic and manganese is pending.

Analyses conducted using SW-846 methods will be in accordance with that edition of SW-846 that is current at the time analyses are performed. Analytical data produced during the ground-water monitoring program will be equivalent to USEPA Level III (i.e., definitive data). Section II.4.A. of the ROD specifies that Ormet may petition U.S. EPA to terminate the ground-water extraction system after three consecutive years of monitoring during which the cleanup goals for ground water are met in all monitoring wells identified as compliance points. Ground-water analyses in conjunction with the last monitoring event will be performed using Contact Laboratory Program (CLP) analytical procedures.

4.0 SAMPLE COLLECTION PROCEDURES

This section describes procedures to be used for the collection of ground-water samples during the Remedial Action ground-water monitoring program. In accordance with Paragraph 23 of the Consent Decree, Ormet will notify USEPA at least 28 days in advance of each ground-water monitoring event, unless shorter notice is agreed to by USEPA. Before initiating ground-water sampling activities each day, a Sampling of Monitoring Wells Daily Checklist (Figure 3) will be filled out. Completion of the form acknowledges that the sampling personnel have reviewed aspects of the sampling procedures that can influence data quality.

4.1 WATER-LEVEL MEASUREMENTS

Before the purging and sampling of monitoring wells, the static water level in each well will be measured and the volume of water in the well calculated. At the start of each sampling event, water-level measurements will be obtained in all site monitoring wells and piezometers. The maximum time for collection of sitewide water-level measurements will be one working day

(approximately 8 to 10 hours). Advantages of collecting a complete round of water levels prior to sampling include the following:

- Provides potentially more accurate data for preparation of ground-water contour/flow maps, relative to measurements collected over a period of days;
- Permits sampling personnel to become familiar with the site;
- Enables sampling personnel to identify unusual circumstances that could affect the sampling program, such as lost or damaged wells; and
- If a well cannot be sampled, modifications may be made to the sampling program.

Water-level measurements will be recorded on a Water Sampling Log (Figure 4) and in the field logbook.

Depth-to-water measurements will be made using an electronic water-level meter (Geotechnical Instruments Dipmeter, Model DM1.3 or equivalent). Prior to taking a round of water-level measurements, the meter will be checked to confirm that it is functioning properly by dipping the probe into tap water and noting that the indicator light and tone are both activated. A water-level measurement is taken by lowering the probe into the well/piezometer, until the indicator light and tone indicate that water has been contacted. The depth-to-water is read directly off of the calibrated tape at the surveyed reference point on the top of the PVC well casing. The depth-to-water measurement will be recorded to the nearest 0.01 foot on the Water Sampling Log (Figure 4) and in a field logbook. Between monitoring locations, the probe will be rinsed in a laboratory-grade detergent solution and then rinsed with deionized or distilled water.

4.2 SET-UP FOR SAMPLE COLLECTION

The preliminary information required on the Water Sampling Log (Figure 4) will be filled out at this time, including project name and number, location, date, time, weather conditions, and sampling personnel. To protect sampling equipment from potential contamination, plastic sheeting will be placed on the ground around the well and the top of the casing will be cleaned with a clean towel. In the event of rain, sampling can be conducted, but only if introduction of rain water to the sample can be prevented.

4.3 PURGING THE WELL

Prior to collecting ground-water samples, at least three (3) times the volume of standing water in the well will be removed. Wells that go dry during evacuation will be sampled when a sufficient volume of water has recharged the well. The adequacy of purging at least three well volumes will be demonstrated by stabilization of pH and specific conductance in the water purged from the well within 10% of successive measurements. In the event that one or both of these parameters do not stabilize to within 10%, the maximum volume of water to be purged from any well will be five (5) well volumes. Readings of these field parameters will be recorded in a field notebook and on the respective Water Sampling Log (see Figure 4) for each well.

The volume of water in a well will be calculated by subtracting the depth to water from the total depth of the well and then multiplying this value by a coefficient which relates the diameter of the well to gallons per linear foot. Coefficients for commonly encountered well diameters are listed on the bottom of the Water Sampling Log (see Figure 4). If a coefficient is not listed for the diameter of a well being sampled, the volume of standing water in the well can be determined by the formula:

$$V = 7.48 \pi r^2 h$$

where, V = Volume of standing water (gallons),

r = Radius of well casing (ft), and

h = Height of standing water (ft).

$\pi = 3.14$, and

7.48 = conversion factor, ft^3 to gallons.

The volume of water purged from the well will be determined using a container of known volume. The rate and volume of water evacuated from the well will be noted on the Water Sampling Log. Evacuations will be accomplished using a polyethylene disposable bailer. Water purged from the monitoring wells prior to sampling will be contained in a small, portable, polyethylene tank equipped with a lid, clearly labelled as purge water, and disposed of through Ormet's on-site ground-water treatment plant.

4.4 SAMPLE COLLECTION PROCEDURES

Monitoring wells will be sampled using disposable, polyethylene, bottom-filling bailers, with polypropylene rope, and equipped with a bottom emptying device. A new bailer will be used for each monitoring well, eliminating the need for decontamination of bailers between wells. Samples will be collected by slowly lowering the bailer into the well so that agitation of the sample is minimized. Sample containers will be filled in the order of decreasing volatility of the parameters being analyzed (e.g., vials for tetrachloroethene analyses will be filled first). Vials for analyses of tetrachloroethene will be filled slowly and completely so that no headspace is present. After being filled, vials for VOC analyses will be inverted and lightly tapped to confirm that air bubbles are not present in the sample.

If a well will not yield the volume of water necessary to immediately fill the required number of sample containers, the filled and partially filled containers will be capped, and kept out of sunlight in a chilled cooler chest until the necessary volume of sample can be obtained. As discussed above, containers for VOC analyses will be filled first. Under no circumstances, will VOC sample containers be left partially filled.

Ground-water samples will be analyzed for dissolved (filtered) metals. Samples designated for dissolved metals analyses will be field filtered prior to being preserved. Field filtration will be performed using a peristaltic pump equipped with Tygon tubing and a 1.0 micron in-line disposable filter (Geotech Dispos-a-Filter or equivalent). Use of 1.0 micron filter will reduce the potential for removal of colloidal particles (commonly 0.001 to 1 micron size) that may be mobile in the relatively coarse sand and gravel aquifer. At least one liter of ground water will be removed from the well and held in a disposable plastic beaker. The peristaltic pump will be used to pump the sample from the holding container, through the in-line filter, and into a pre-preserved sample container. For each well being sampled, a new holding beaker, new tubing, and a new filter will be used.

4.5 FIELD ANALYSES OF GROUND-WATER SAMPLES

Because these properties are difficult to preserve during storage, measurements of temperature, pH, and specific conductance will be made in the field at the time of ground-water sampling. Field measurement results will be recorded on the Water Sampling Log (see Figure 4) and also in a bound field log book. Between measurements, the probes on the meter(s) will be thoroughly rinsed with distilled or deionized water.

At the beginning of each day, the field meter(s) will be calibrated in accordance with manufacturer's instructions. The date(s) and results of field instrument calibration will be recorded in the field log book. For pH, the calibration will be a standard two-buffer calibration. Commonly available buffers have nominal pH values of 4, 7 (sometimes 6.86), and 10. The two buffers that are most likely to bracket the sample pH values will be used. Prior to measuring pH

at each monitoring well, a one-point calibration (pH 7) will be performed. A two-point calibration will also be performed at the end of each day. For specific conductance, the meter will be calibrated at the beginning of each day using a standard solution with a conductance similar to the expected values of ground-water samples. Calibration solutions will be decanted from the storage bottle to a small beaker for calibration and then discarded.

4.6 SAMPLE PREPARATION & PACKAGING

Samples will be prepared and held in accordance with the requirements specified in Table 1. Ground-water samples will be preserved in accordance with the Manual of Ground-Water Sampling Procedures (Scalf and others, 1981), or as specified by the laboratory selected to perform the analyses. Preservatives to be used in fixing ground-water samples are included in Table 1 and will be added to sample containers prior to sample collection, typically by the laboratory prior to shipment.

After being prepared/preserved, all samples will be stored in a cooler chest at a temperature of approximately 4°C until they are delivered to the laboratory.

4.7 FIELD QA/QC SAMPLES

Three types of QA/QC samples will be collected in the field during sampling activities, including:

- Equipment/Rinsate blanks,
- Trip blanks, and
- Duplicate samples.

4.7.1 Equipment/Rinsate Blanks

Equipment, or rinsate, blanks will be collected to monitor the effect of sample collection materials and equipment decontamination procedures on sample integrity. One equipment blank will be collected during each ground-water sampling event. The equipment blank will be prepared by thoroughly rinsing a new, unused disposable bailer with laboratory pure water and using the rinsate to fill a complete set of sample containers for laboratory analyses. At least one liter of rinsate will be field filtered, as described in Section 4.6, and submitted for dissolved metals analyses.

4.7.2 Trip Blanks

Because volatile organic compounds (i.e., tetrachloroethene) are being analyzed on ground-water samples collected for selected wells, trip blanks will be prepared and analyzed. Trip blanks are used to monitor possible cross-contamination of the ground-water sample containers (both empty and filled) during shipping and while they are at the site or being stored prior to delivery back to the laboratory. Trip blanks will be prepared in the laboratory, using laboratory pure water to fill a set of 40 ml vials. The filled vials will then accompany the empty sample containers during shipping, and will remain in the shipping container until it is returned to the laboratory with the filled sample bottles. One trip blank will be included in each shipping container that contains samples designated for volatile organics analyses.

4.7.3 Duplicate Samples

To provide a check of laboratory performance and data comparability, duplicate samples will be collected and submitted to the laboratory. Duplicate samples will be identified using a fictitious sample identification. One duplicate sample will be collected during each ground-water monitoring event.

Duplicate ground-water samples will be collected by distributing the water from each bailer in approximately equal proportions among the sample containers being filled. The fictitious sample identification number that is assigned to the duplicate will be recorded on the Water Sampling Log for the well being sampled and in the field log book.

4.8 RECORDING OF FIELD DATA AND LABELING OF SAMPLES

4.8.1 Recording Field Data

At the time of sampling, sampling personnel will complete the appropriate field log forms to record information about each sample collected. The standard Water Sampling Log is shown in Figure 4 and includes, in addition to project information and well evacuation data, the following information on sampling:

- Physical appearance of samples
- Field observations
- Results of field analyses
- Sampling methods and materials
- Parameters to be analyzed
- Sample container type, size, and preservation
- Sampling personnel

In addition to the field log forms described previously, the field team will use a bound field logbook to record all sampling events and field observations. The log book will be kept in a secure, dry place. Entries in the log book will be dated and signed by the person making the entry. Entries may not be made in water-soluble ink. The type of information to be recorded in the log book includes the following:

- Date
- Project Name
- Project Number
- Location
- Weather conditions
- Sampling personnel
- Work progress
- Results of field analyses
- Fluid-level measurements
- Identification of field QA/QC samples

The following types of information, not normally recorded on the field log forms, will be included in the log book, as applicable:

- Site visitors
- Delays
- Unusual situations
- Well condition/damage
- Departures from established QA/QC field procedures
- Instrument problems and actions taken
- Accidents

4.8.2 Sample Labels

Sample labels identify and prevent misidentification of the samples. The labels will be affixed to the sample containers (not the caps) prior to the time of sampling. Sample labels will be completed in water proof ink at the time of collection and will include the following information:

- Sample designation,
- Date and time of collection,
- Sampling personnel/affiliation,
- Project number,
- Site location,
- Parameters to be analyzed, and
- Preservative type, if any.

Once the labels have been completed and affixed to the containers, they will be covered with clear acetate tape for protection. An example of the sample label to be used is provided in Figure 5.

4.9 FIELD CHAIN-OF-CUSTODY PROCEDURES

Sample custody procedures are intended to provide documentation of the preparation, handling, storage, and shipping of all samples collected during this project. Samples will be the responsibility of designated field personnel from the time the empty sample containers are received from the laboratory, until the collected samples are relinquished to a courier service or directly to the laboratory.

In advance of a scheduled sampling program, the laboratory conducting the analyses will be contacted to arrange for delivery of the appropriate sample containers. When the shipment of sample containers is received, a member of the sampling team will inspect and inventory the shipment relative to the planned sampling and analytical program. The shipment will be inspected to confirm that the appropriate number and types of containers have been provided and that they contain the proper preservative, if applicable. Any comments or discrepancies regarding the shipment will be noted in the field log book. If needed, the laboratory will be contacted immediately to correct any deficiencies.

After each sample container is filled in the field, a Chain-of-Custody Seal (Figure 6) will be placed over the lid of the container. The Chain-of-Custody Seal will be initialed and dated by a member of the sampling team.

For each shipping container being returned to the laboratory, a Chain-of-Custody Record (Figure 7) will be completed. The Chain-of-Custody Record will be completed using waterproof ink and will include the following information:

- Sample identification numbers,
- Date and time collected,
- Total number of sample containers,
- Sample container types, sizes, and preservative,
- Sample matrix,
- Project number and name/location,
- Sampling personnel,
- Analyzing laboratory,
- Status of custody seals,
- Date and time relinquished, and
- Method of delivery.

The original Chain-of-Custody Record will accompany the shipping container. A copy of the Record will be retained by the field personnel and placed in the project file. The individuals relinquishing and receiving the samples will sign, date, and note the time on the Record. The Record documents the transfer of sample custody from the sampling team to the analytical laboratory. If a common carrier or laboratory courier is being used to ship the samples, the Chain-of-Custody Record will then be sealed in a zip-lock plastic bag and placed in the shipping container. The container will then be sealed with at least two chain-of-custody seals that have been signed and dated by a member of the sampling team. If the samples are being delivered directly to the laboratory by a member of the sampling team, the Laboratory Sample Custodian will sign the Chain-of-Custody Record, acknowledging receipt of the samples. The internal chain-of-custody protocols to be used by the laboratory during analysis of the samples are described in the Quality Assurance Project Plan, which was provided as an attachment to the Remedial Design Work Plan approved by USEPA.

5.0 DATA REDUCTION, EVALUATION AND REPORTING

Laboratory analytical data produced during the routine ground-water monitoring program will be validated by reviewing sampling documentation and field QA/QC sample results, and by comparing laboratory QA/QC data to acceptance criteria set forth in the laboratory Quality Assurance Plan. Analytical data generated at the conclusion of the monitoring program using

CLP protocols will be validation in general accordance with the most current version of the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review, as applicable. Validated laboratory data, results of field analyses, and ground-water elevation data will be maintained in a database (e.g., Microsoft Access) to facilitate manipulation and graphing. Analytical data for each of the compliance point monitoring wells will be graphed versus time as a direct means of evaluating trends in constituent concentrations in the alluvial aquifer.

Analytical results from the expanded annual monitoring event will be used to construct plume isopleth maps for total cyanide and fluoride. These maps will be used in estimating the contaminant mass-in-place, in a manner similar to that utilized to estimate the current mass-in-place, as described in HMI's August 1996 report *Estimation of Dissolved Contaminant Mass in the Alluvial Aquifer*. In accordance with Section II.3.C. of the SOW, the annual mass-in-place estimates will be compared to evaluate aquifer restoration progress. Also, reductions in the estimated mass-in-place from year to year will be compared to the contaminant mass removed through pumping of the interceptor wells. As a further check of the performance of the remediation, the approximate area of the aquifer containing fluoride and cyanide levels above the cleanup goals set forth in the ROD will be estimated each year.

As specified in Section II.4.A. of the ROD, Ormet may petition USEPA to terminate the ground-water extraction system after three consecutive years of monitoring during which the cleanup goals for ground water are met in all monitoring wells identified as compliance points.

Within 30 days following receipt of the analytical results for each monitoring event, Ormet will submit two copies of the tabulated analytical results and ground-water elevation data to the USEPA Remedial Project Manager (RPM) and to the Ohio Environmental Protection Agency (OEPA). Within 90 days following the end of each calendar year, Ormet will submit an annual monitoring report to the USEPA RPM and to the OEPA. The annual monitoring report will include the following information:

- **Tabulated analytical results and ground-water elevation data for all three routine monitoring events conducted during the year;**
- **A validation summary for that year's data;**
- **Updated graphs of analytical results for the compliance point monitoring wells;**
- **Fluoride and cyanide isopleth maps based on the results from the expanded annual monitoring event;**
- **Ground-water elevation contour maps for each monitoring event during that year;**
- **Estimations of the cyanide and fluoride mass-in-place based on the expanded annual monitoring event; and**
- **Calculation of the contaminant mass removed through pumping of the interceptor wells.**

TABLES

TABLE 1

ANALYTICAL METHODS AND PACKAGING AND PRESERVATION SUMMARY
FOR GROUND-WATER ANALYSES
ORMET PRIMARY ALUMINUM CORPORATION
HANNIBAL, OHIO

ANALYTICAL PARAMETERS	UNITS	DETECTION LIMIT	CONTAINER TYPE	PRESERVATIVE	HOLDING TIME MAXIMUM	VOLUME (ML)	METHOD
Arsenic	mg/L	0.004	Plastic	HNO ₃ (pH < 3)	6 months	100	SW846/6010 - trace ICP
Beryllium	mg/L	0.0005	Plastic	HNO ₃ (pH < 3)	6 months	100	SW846/6010 - trace ICP
Manganese	mg/L	0.01	Plastic	HNO ₃ (pH < 3)	6 months	100	SW846/6010
Sodium	mg/L	0.5	Plastic	HNO ₃ (pH < 3)	6 months	100	SW846/6010
Vanadium	mg/L	0.01	Plastic	HNO ₃ (pH < 3)	6 months	100	SW846/6010
Cyanide (total)	mg/L	0.01	Plastic or Glass	NaOH (pH > 12)	14 days	100	SW846/9010A
Cyanide (amenable)	mg/L	0.01	Plastic or Glass	NaOH (pH > 12)	14 days	100	SW846/9010A
Tetrachloroethene	mg/L	0.005	Glass	HCL (pH < 2)	14 days	40	SW846/8260
Fluoride	mg/L	0.1	Plastic	4°C	28 days	25	EPA 340.2
pH	S.U.		Plastic or Glass	4°C	6 hrs.	40	EPA 150.1
Specific Conductance	µmhos/cm	1	Plastic or Glass	4°C	6 hrs.	100	EPA 120.1

FIGURES

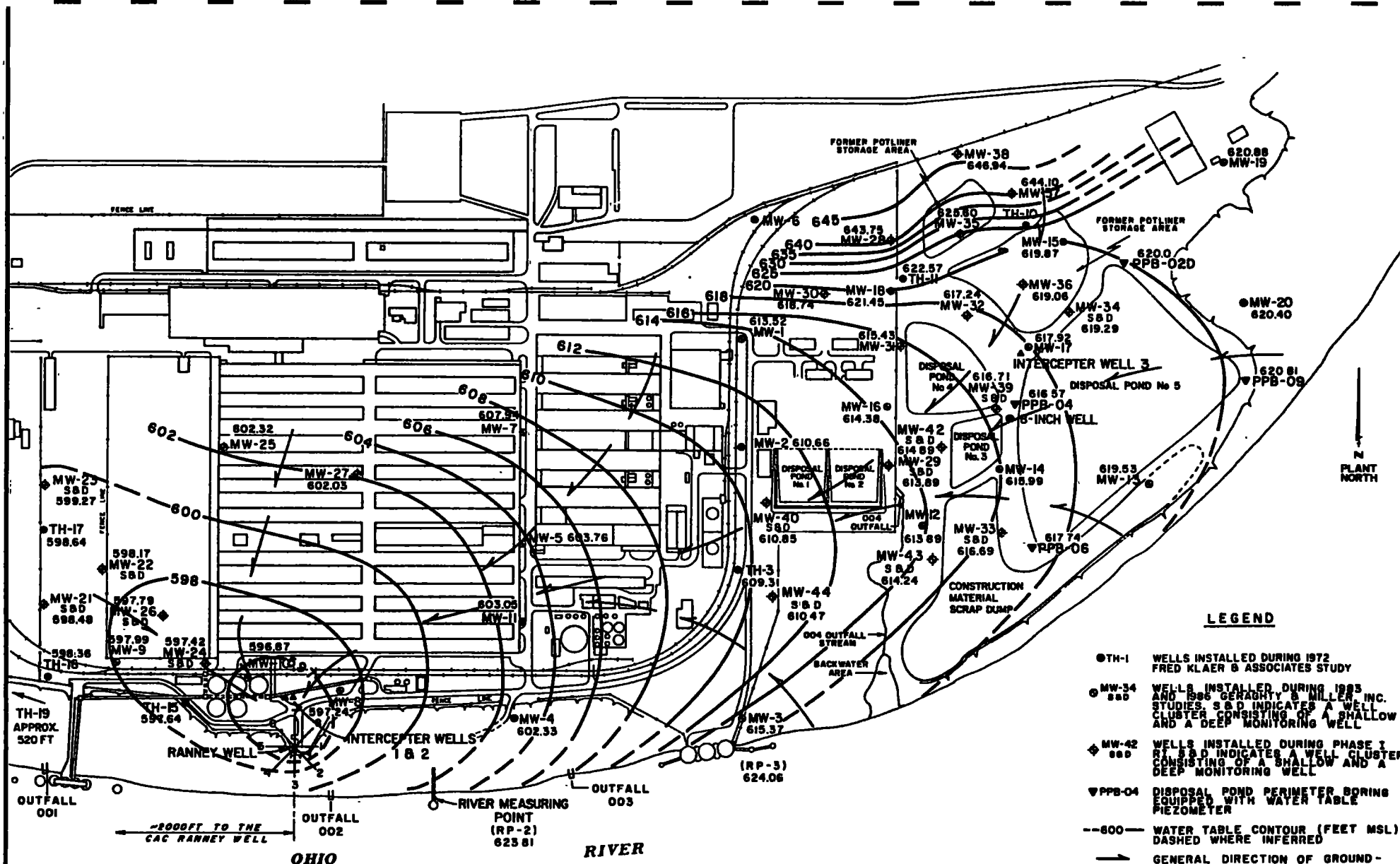
1

2

3

4

5



HydroSystems Management, Inc.
 Glen Works Center - Suite 109
 331 S. Main Street
 Washington, Pennsylvania 15301

DRAWING NO.

DRAWN BY: DATE

CHECKED BY: DATE

APPROVED BY: DATE

**WATER-TABLE CONTOUR MAP BASED
 ON WATER-LEVEL DATA
 COLLECTED 2-20-90**
 ORMET CORPORATION

HANNIBAL

FIGURE

2

OHIO

SAMPLING OF MONITORING WELLS DAILY CHECKLIST



PROJECT NO: _____
 LOCATION: _____
 SAMPLING PERSONNEL: _____
 COMPLETED BY: _____

WELL(S): _____
 DATE: _____
 TIME: _____

ITEMS	OK	NA	NOTES
PRIOR TO SAMPLING			
Health & safety plan; reviewed; equipment ready.			
Sample containers, coolers, received from laboratory; ice or ice pack and coolers ready.			
Sampling equipment and supplies inventoried, clean and operational.			
On-site client contact notified.			
Condition of well noted.			
Well area prepared for sampling; plastic placed around well; gasoline-powered pumps placed downwind.			
Water-level measurements made and recorded on Water Sampling Log with other pertinent field information.			
Field instruments calibrated; calibration recorded in field logbook			
Sample containers labelled; preservatives added, if necessary.			
DURING AND AFTER SAMPLING:			
Three to five well volumes purged.			
Sample collected using a bailer or pump as per sampling plan.			
Measurement of field parameters recorded on Water Sampling Log and in field log book.			
Sample containers filled according to collection protocol of analyses.			
Field and trip blanks collected; replicates or split samples collected and recorded in field log book.			
Samples stored on ice in coolers.			
Water Sampling Log and Chain-of-Custody Recorded completed.			
Reusable equipment decontaminated; non-reusable equipment disposed of in appropriate manner.			
Well secured and locked.			

Additional Comments:

Original to Field Project File; copy to Project Manager and to QA Officer.



DRAWING NO.

DRAWN BY: DATE

CHECKED BY: DATE

APPROVED BY: DATE

**SAMPLING OF MONITORING
WELLS DAILY CHECKLIST**

FIGURE

3



WATER SAMPLING LOG

Page ____ of ____

Project Name: _____

Sample ID: _____

Project Number: _____

Replicate ID: _____

Site Location: _____

Time Sampling Began: _____

Sampling Date: _____ Weather: _____

Time Sampling Completed: _____

EVACUATION DATA

Description of Measuring Point (MP) _____

MP Elevation _____ Diameter of Well Casing _____

Total Sounded Depth of Well Below MP (TD) _____ Gallons to be Purged _____

Depth to Water Below MP (DTW) _____ (3 WCVs, 5 WCVs, etc.) _____

Water Column (WC) in Well (TD-DTW) _____

Gallons per foot (GPF); from chart _____

Gallons in Well (WC x GPF) _____ = Well Casing Volume (WCV) _____

GALLONS PER FOOT (gpf)			
1 1/2" = 0.08	2" = 0.16	3" = 0.37	4" = 0.68
1 1/2" = 0.08	2 1/2" = 0.26	3 1/2" = 0.50	6" = 1.47

Evacuation Method and Material _____

SAMPLING DATA AND FIELD PARAMETERS

Color: _____ Odor: _____ Turbidity: _____ Temperature (°C/°F): _____

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance (µmhos/cm) _____ pH (Standard units) _____

Oxidation Reduction Potential (mV) _____

Sampling Method and Material(s) _____

Parameters to be Analyzed

Container Description

From Lab ____ or HMI ____

Preservative

preserved by: Lab ____ or HMI ____

Sampling Personnel: _____

Comments: _____



DRAWING NO.

DRAWN BY: _____ DATE _____

CHECKED BY: _____ DATE _____

APPROVED BY: _____ DATE _____

WATER SAMPLING LOG

FIGURE

4

HMI Project No. _____
 Name/Location: _____
 Sample I.D.: _____
 Sample Type: ☒ Grab ☐ Composite
 Sample Medium: Ground Water
 Date: _____ Time: _____
 Analysis Requested: _____
 Preservative: _____
 Sampled by: _____



DRAWING NO.

DRAWN BY: DATE

CHECKED BY: DATE

APPROVED BY: DATE

SAMPLE LABEL

FIGURE

5

HMI
CHAIN-OF-CUSTODY SEAL

NAME: _____

DATE: _____



DRAWING NO.

DRAWN BY: _____ DATE _____

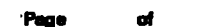
CHECKED BY: _____ DATE _____

APPROVED BY: _____ DATE _____

CHAIN-OF-CUSTODY SEAL

FIGURE

6

[illegible]

Sample Code: L = Liquid; S = Solid; A = Air

Total Number of Containers:

Relinquished by: _____	Organization: _____	Date: _____	Time: _____	Seal Intact?
Received by: _____	Organization: _____	Date: _____	Time: _____	Yes No NA
Relinquished by: _____	Organization: _____	Date: _____	Time: _____	Seal Intact?
Received by: _____	Organization: _____	Date: _____	Time: _____	Yes No NA

REMARKS:

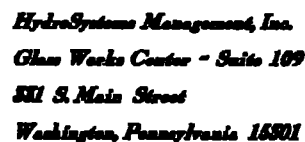
DELIVERY METHOD:

In Person

Common Carrier

Lab Courier

Other



DRAWING NO.

DRAIN BY: _____ DATE _____

CHECKED BY:	DATE
-------------	------

APPROVED BY: DATE

CHAIN-OF-CUSTODY RECORD

FIGURE

7